Towards Package Baseline proposal for 100GEL

Liav Ben Artsi, Marvell Israel Ltd.

October 2018

IEEE P802.3ck 100 Gb/s, 200 Gb/s, and 400 Gb/s Electrical Interfaces Task Force

Executive Summary

- An initial PKG model was supplied during the September interim
- A mathematical model was matched vs. the extracted model (thanks Rich!)
- The PKG parameters were updated according to inputs received during the interim
- **A new approach to PKG cases coverage will be suggested to be used as a PKG base line**

PKG Suggested Parameters

- Following September interim nominal PKG impedance was voted to be 92.5Ω
- Ball and PTH discontinuities were optimized and rated @ 75-90fF ➔ recommend using 80fF @ the COM excel
- COM mathematical model was matched to the extracted package
  – The mathematical representation gives slightly better results compared to actual concatenated PKG extraction
- Former projects have used 14Taps of DFE @ half rate ➔ doubling the rate requires extending compensation depth above 16Taps ➔ recommend 20-24 taps depth (but not a part of this baseline)

Which Cases Should We Examine in COM?

- 30mm 87.5ohm PKG trace + 92.5mm PTH [Trace includes -5ohm manufacturing tolerance] – **Recommend including**
- 12mm 87.5ohm PKG trace + 92.5mm PTH [only trace includes some manufacturing tolerance] – Runs resulted in ~2dB COM difference **Recommend Excluding**
- 30mm 97.5ohm PKG trace + 92.5mm PTH [Trace includes +5ohm manufacturing tolerance] – **Recommend including**

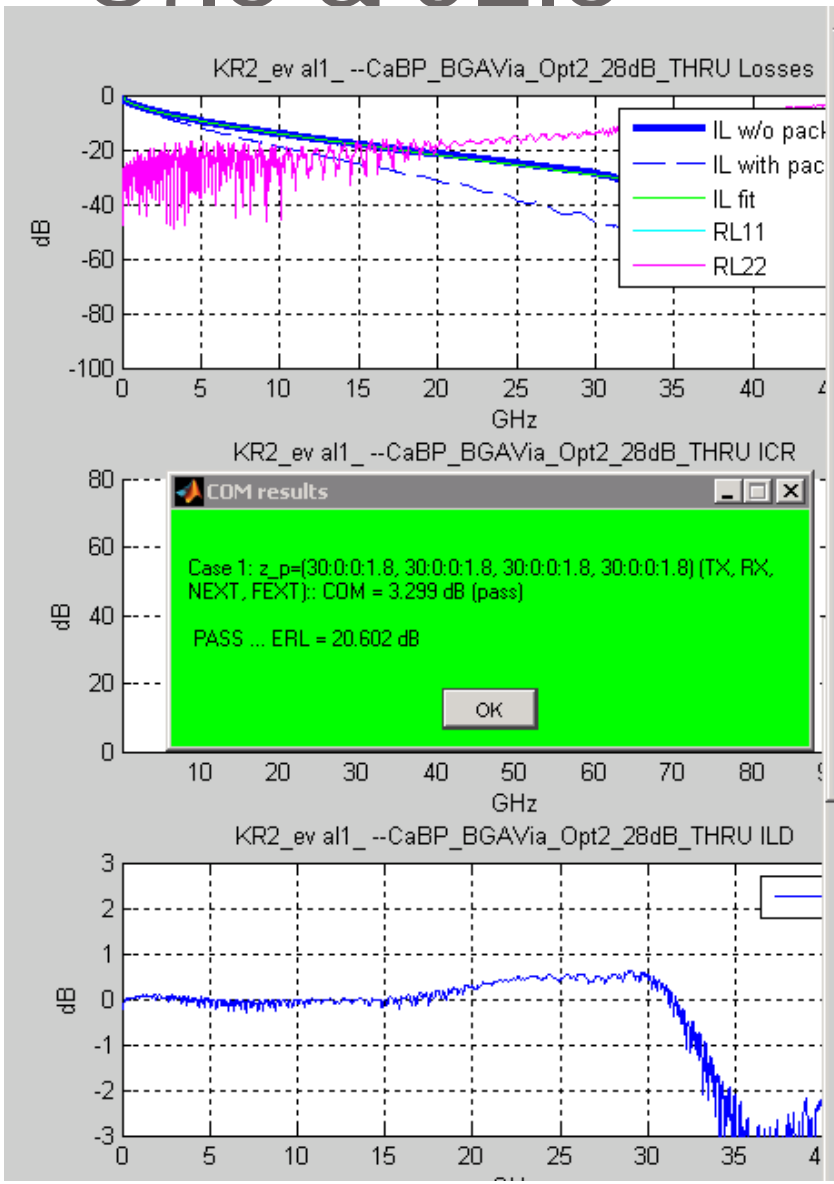
  The intention is to avoid misleading the COM users to mistakenly consider the manufacturing tolerance as the nominal case…

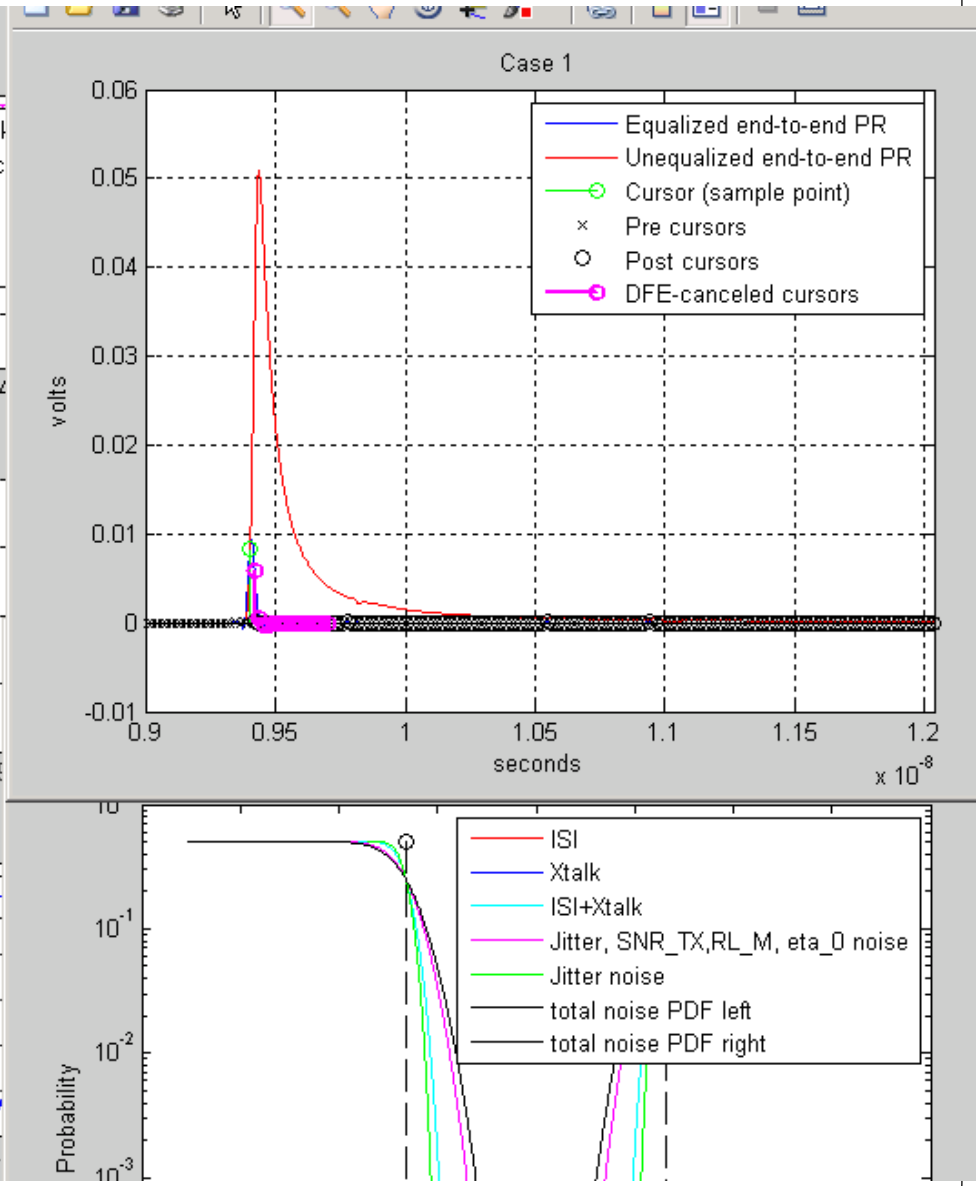
How Many Tlines Do we Need?

- It was shown that one Tline for trace and a short one at the ball location (to represent the PTH) comes "close enough" to represent the PKG trace, therefore….
  - **Recommend using only two of the Tlines in the flexible PKG model**

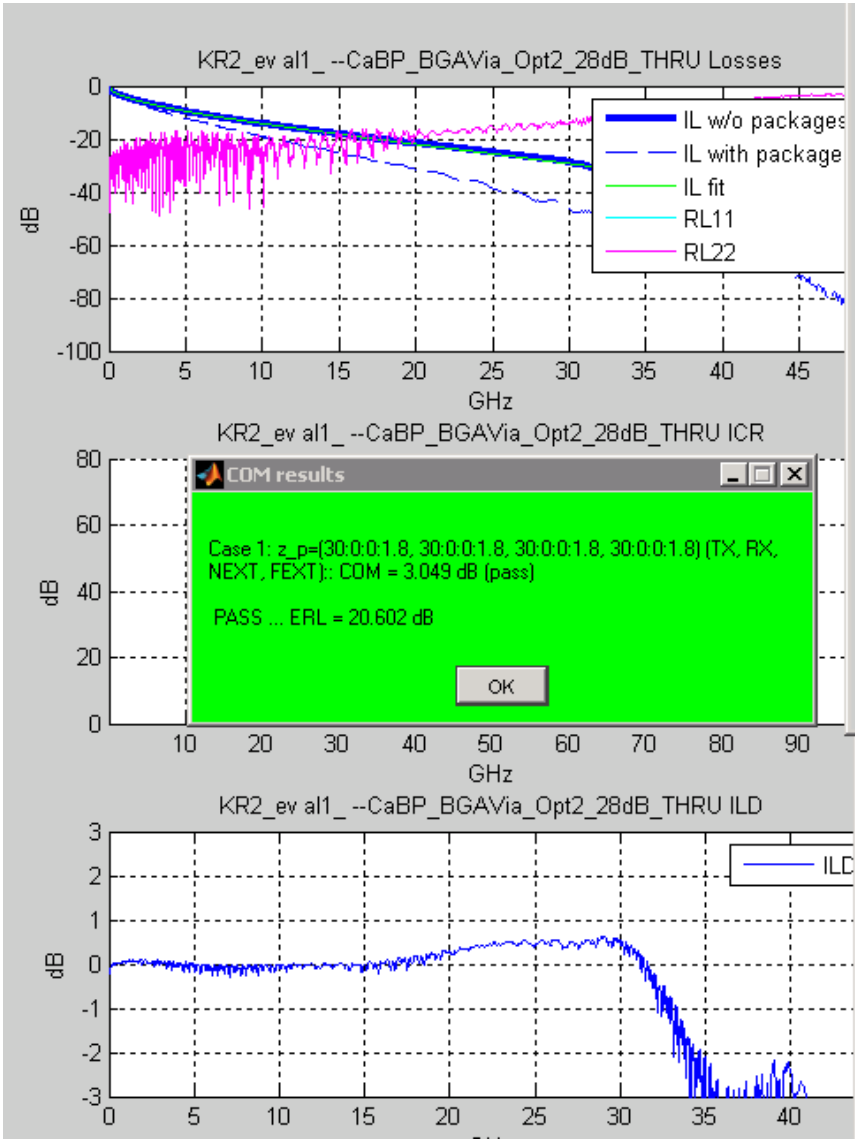
Thank you

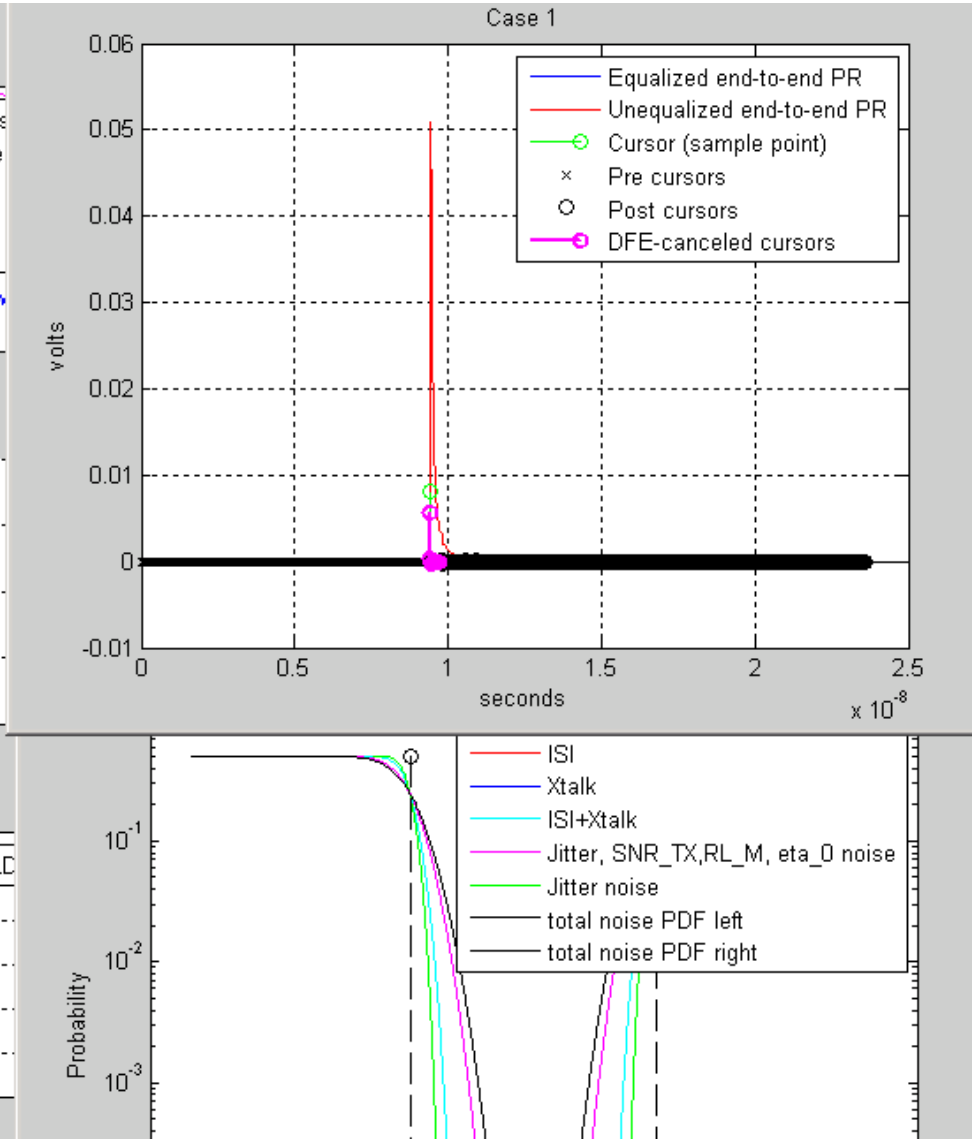
87.5 & 92.5


KR2_ev al1_ --CaBP_BGAVia_Opt2_28dB_THRU Losses
dB
GHz
IL w/o pack
IL with pac
IL fit
RL11
RL22
KR2_ev al1_ --CaBP_BGAVia_Opt2_28dB_THRU ICR
COM results
Case 1: z_p=(30:0:0:1.8, 30:0:0:1.8, 30:0:0:1.8, 30:0:0:1.8) (TX, RX, NEXT, FEXT):: COM = 3.299 dB (pass)
PASS ... ERL = 20.602 dB
OK
KR2_ev al1_ --CaBP_BGAVia_Opt2_28dB_THRU ILD

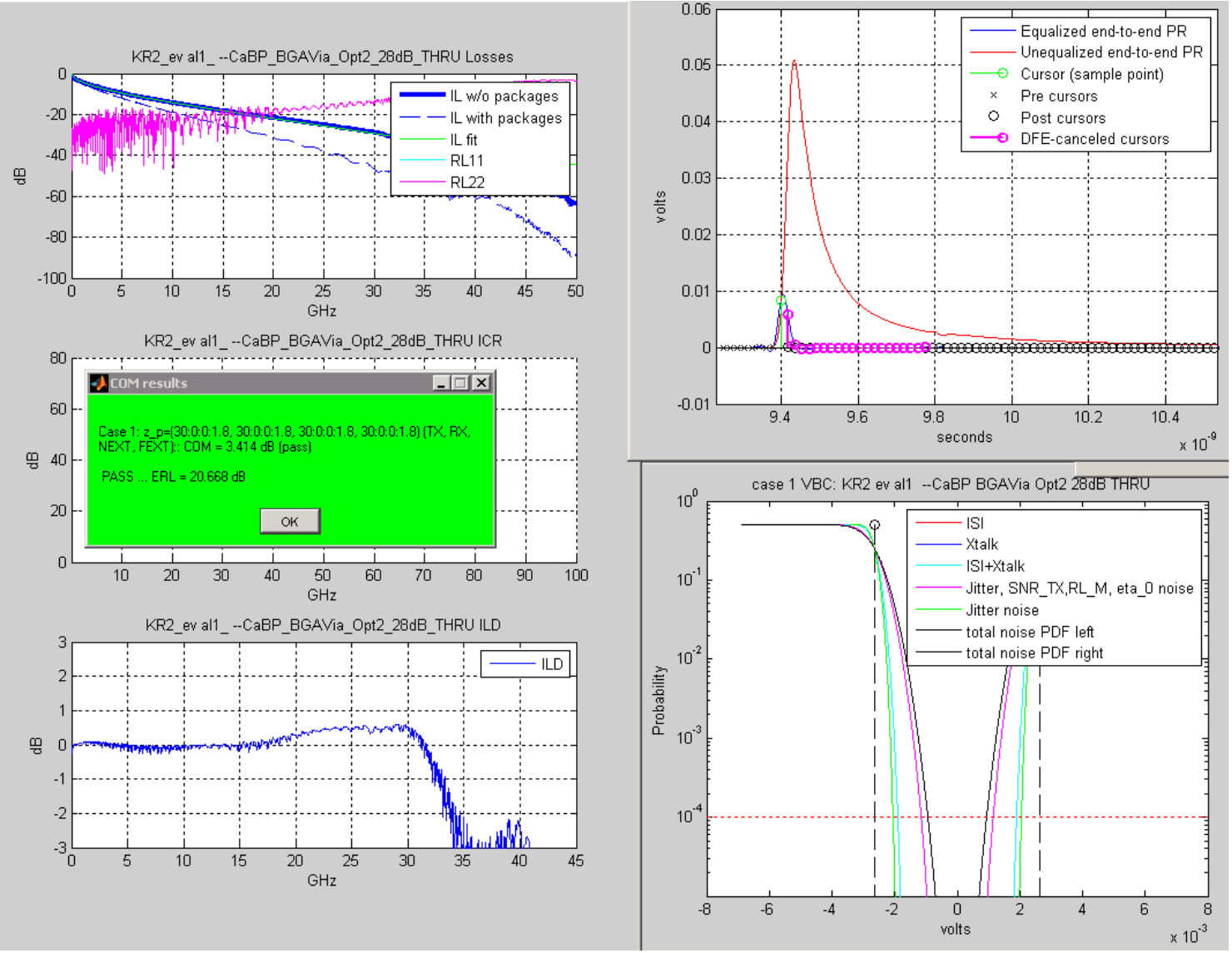

Case 1
Equalized end-to-end PR
Unequalized end-to-end PR
Cursor (sample point)
Pre cursors
Post cursors
DFE-canceled cursors
volts
seconds
x 10^-8
ISI
Xtalk
ISI+Xtalk
Jitter, SNR_TX,RL_M, eta_0 noise
Jitter noise
total noise PDF left
total noise PDF right
Probability

97.5 & 92.5

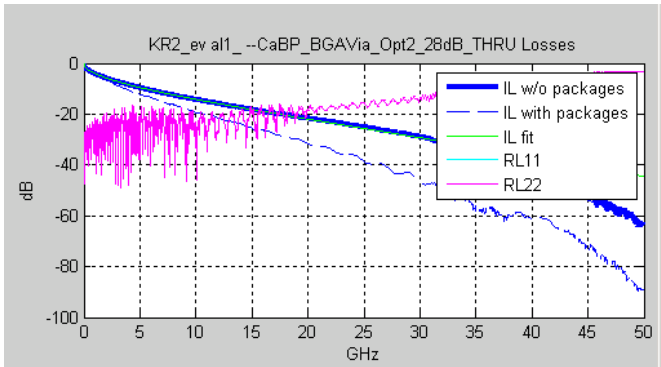

KR2_ev al1_ --CaBP_BGAVia_Opt2_28dB_THRU Losses
dB
GHz
IL w/o package
IL with package
IL fit
RL11
RL22
KR2_ev al1_ --CaBP_BGAVia_Opt2_28dB_THRU ICR
COM results
Case 1: z_p=(30:0:0:1.8, 30:0:0:1.8, 30:0:0:1.8, 30:0:0:1.8) (TX, RX, NEXT, FEXT):: COM = 3.049 dB (pass)
PASS ... ERL = 20.602 dB
OK
KR2_ev al1_ --CaBP_BGAVia_Opt2_28dB_THRU ILD
ILD

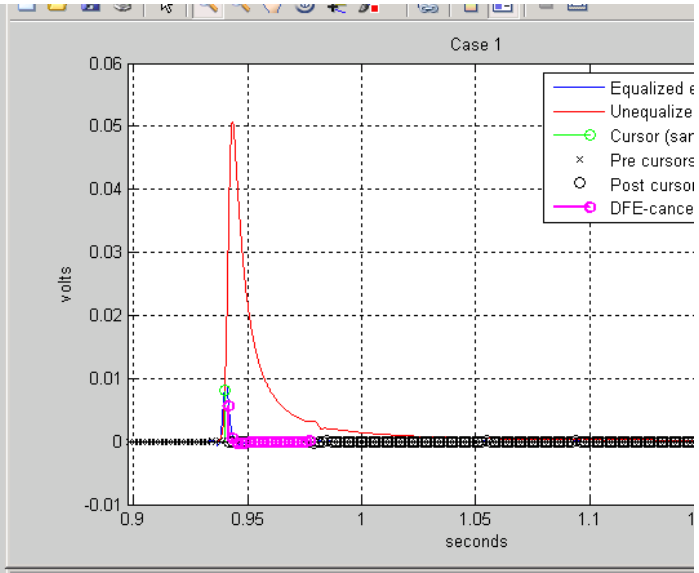

Case 1
Equalized end-to-end PR
Unequalized end-to-end PR
Cursor (sample point)
Pre cursors
Post cursors
DFE-canceled cursors
volts
seconds
x 10^-8
ISI
Xtalk
ISI+Xtalk
Jitter, SNR_TX,RL_M, eta_0 noise
Jitter noise
total noise PDF left
total noise PDF right
Probability

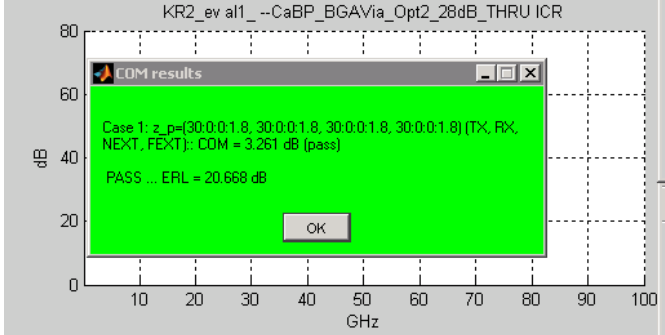
87.5; 92.5 20tap DFE

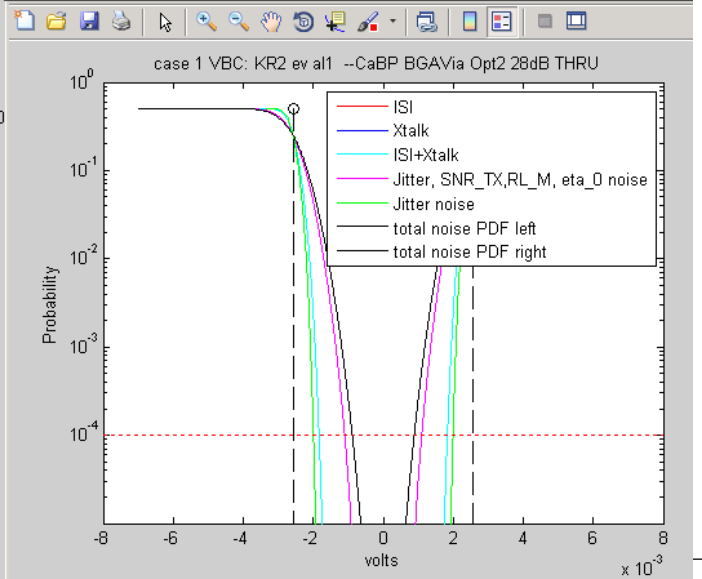


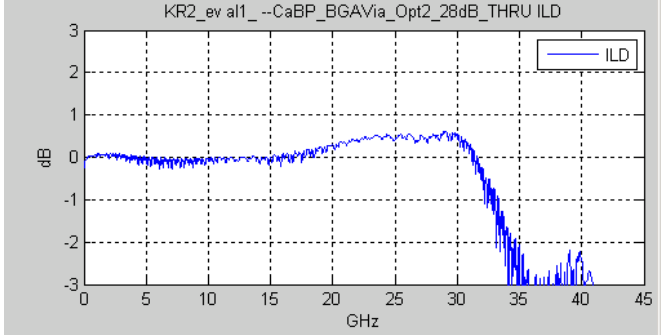
97.5; 92.5; 20Tap DFE



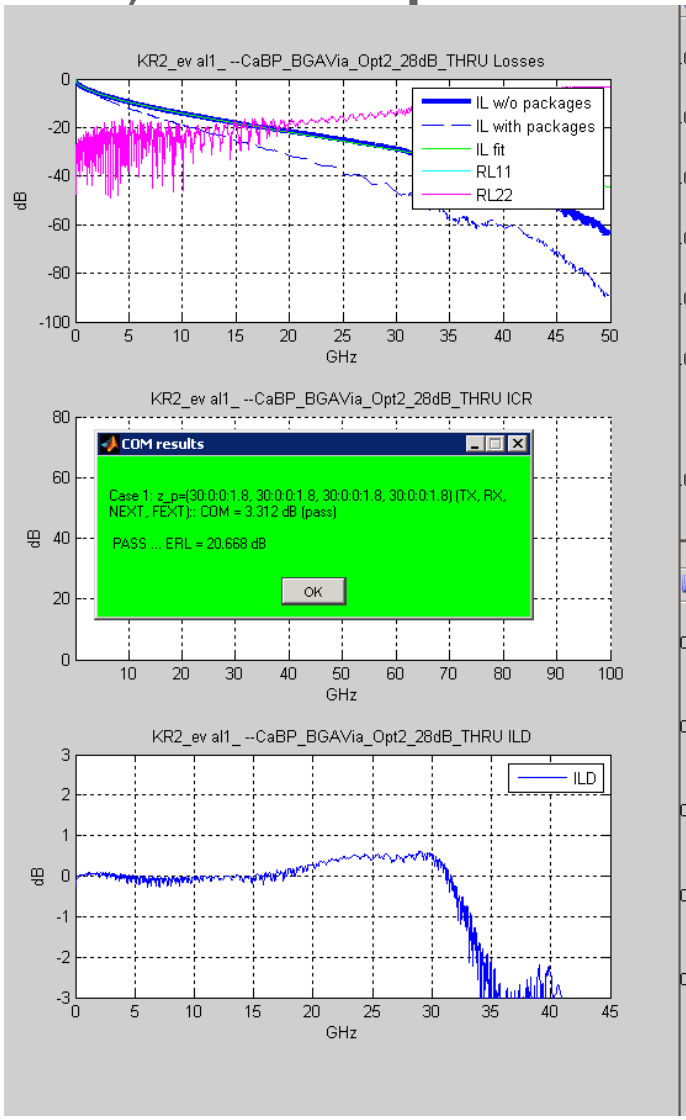


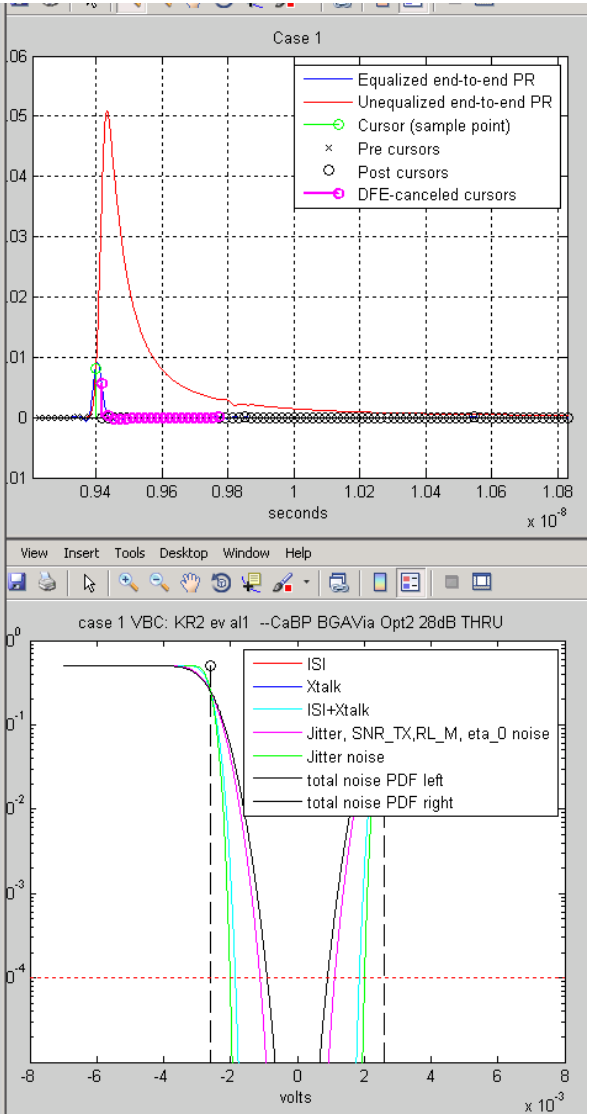




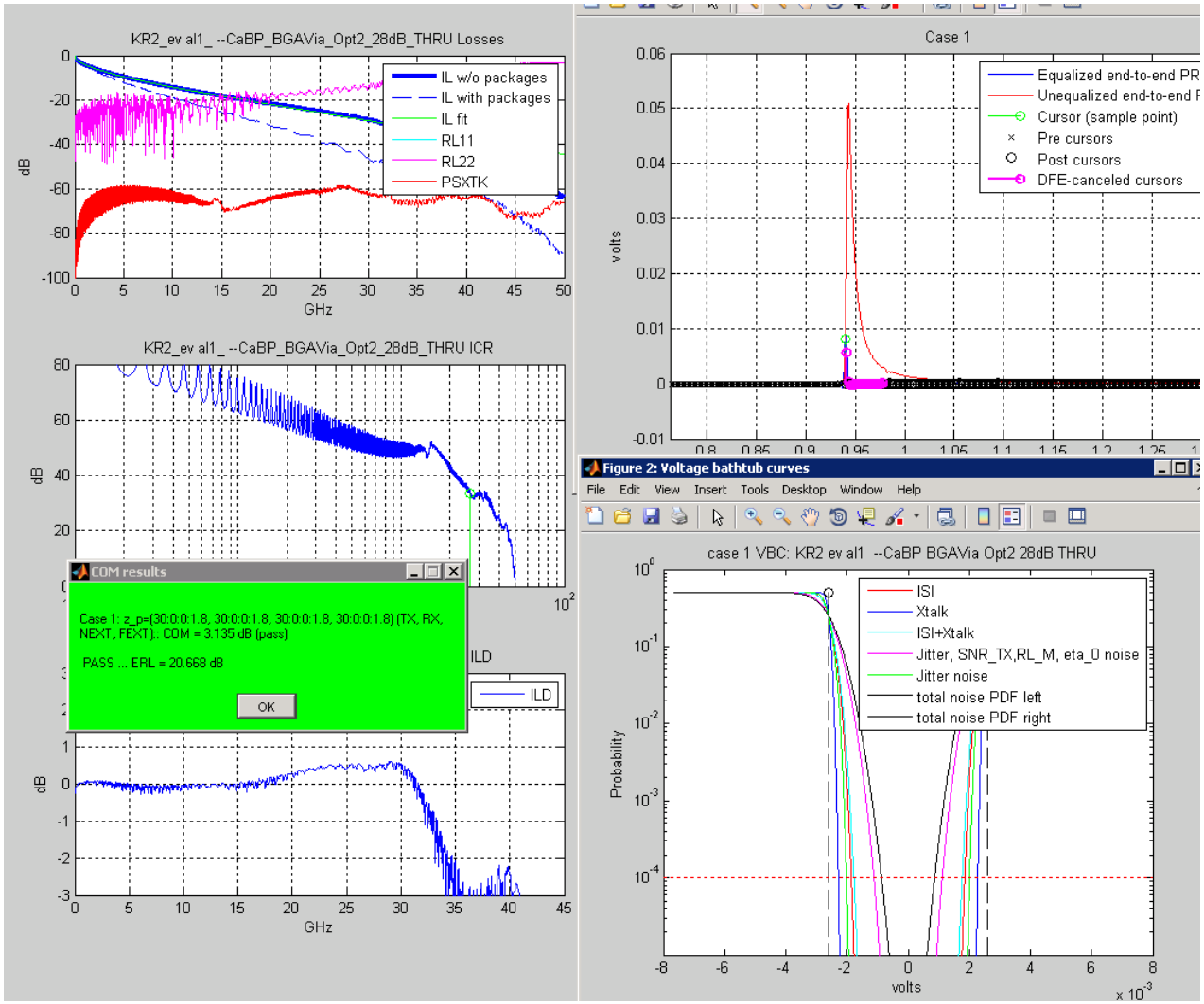


92.5; 92.5; 20Tap DFE





92.5; 92.5; 20Tap DFE including XTalk



97.5; 92.5; 20Tap DFE including XTalk